

County Versus Private Hospitals: Access of Care, Management and Outcomes for Patients with Appendicitis

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ABSTRACT

Background and Objectives: Race/ethnicity and socioeconomic status may affect healthcare access (higher appendiceal perforation [AP] rates), management (lower laparoscopic appendectomy [LA] rates), and outcomes in patients with appendicitis. This study determines if disparities exist between county and private hospitals.

Methods: A review of patients ≥ 18 years treated for appendicitis from 1998 through 2007 was performed. Data from a county hospital were compared to data from 12 private hospitals. Study outcomes included length of hospitalization (LOH), and rates of AP, LA, and abscess drainage. Predictor variables collected included age, sex, race/ethnicity, per-capita income, and hospital type.

Results: For this study, 16,512 patients were identified (county=1,293, private=15,219). On univariate analysis, patients at the county hospital had lower mean per-capita incomes (\$13,412 vs. \$17,584, $P<.0001$), similar AP rates at presentation (26% vs. 24%, $P=.10$), and lower abscess drainage (0.2% vs. 2.1%, $P<.0001$). However, multivariate analysis demonstrated a higher AP (OR 1.4, CI 1.2–1.6) and LA rate (OR 1.9, CI 1.7–2.2), a lower abscess drainage rate (0.07, 95%CI 0.02–0.27), and longer LOH (parameter estimate = 0.4, $P<.0001$) at the county hospital. Within the county hospital cohort, LOH and rates of AP, LA, and abscess drainage were similar across all races/ethnicities and income levels.

Conclusions: When compared to private hospital patients, adults with appendicitis treated at a county hospital were of lower socioeconomic background, had higher AP rates and longer LOH, but were more likely to undergo LA

and less likely to require abscess drainage. Since racial and socioeconomic disparities were no longer apparent once within the county hospital cohort, these differences may be due to differences in access to healthcare.

Key Words: Healthcare disparities, Appendicitis, Laparoscopic appendectomy.

INTRODUCTION

Eliminating disparities in healthcare has become an increasingly important issue for health services research. With respect to surgical care, significant racial/ethnic and socioeconomic differences have led to unequal access to care.^{1–7} Appendicitis is one of the most common surgical emergencies and is also a time-sensitive condition. Treatment delays increase the risk of appendiceal perforation (AP), and thus, AP rates have been used as a proxy to measure access to surgical care. Differences in race/ethnicity and socioeconomic status have led to marked differences in AP rates.^{1–7} However, when patients have equal access to care, these differences were eliminated.^{8,9}

In addition to unequal access to care, significant racial/ethnic and socioeconomic differences exist with respect to surgical management, because minorities and uninsured or publicly insured patients have fewer minimally invasive procedures.¹⁰ Studies in adults and children have shown disparities with respect to laparoscopic appendectomy (LA) in the treatment of appendicitis.^{11–13} What remains relatively unknown is whether hospital factors play a role in these disparities. Thus, this study determines whether hospital type (county versus private) affects healthcare access (AP rates), management (LA rates), and outcomes in adults with appendicitis.

METHODS

This study was approved by the Institutional Review Board at Kaiser Permanente, Los Angeles Medical Center and Harbor-UCLA Medical Center. The Southern California Kaiser Permanente Discharge Abstract Database (PDAB) was retrospectively reviewed to identify adult patients (age ≥ 18 years) with a diagnosis of appendicitis

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(*International Classification of Diseases, Ninth Revision [ICD-9]* codes 540.0, 540.1, 540.9) between January 1, 1998 and December 31, 2007. A similar review was performed at Harbor-UCLA.

Southern California Kaiser Permanente consists of 11 medical centers and provides comprehensive medical care to over 3.5 million members. All members are insured and have equal access to any of the KP clinics, emergency rooms, or medical centers. Harbor-UCLA is a safety net hospital that provides care to anyone that presents to the emergency room, independent of insurance, financial, or immigration status. For this study, Harbor-UCLA represents the county hospital and Kaiser Permanente represents the private hospitals.

Study outcomes were AP rates, LA rates, need for post-operative abscess drainage (percutaneously or surgically), and length of hospitalization (LOH). Higher pre-operative AP rates suggest poorer access to healthcare, whereas increased intraabdominal abscess drainage and longer LOH suggest greater resource utilization. Independent variables collected included age, sex, race/ethnicity, per-capita income, and hospital type. With respect to race/ethnicity, patients were categorized as White, Black, Hispanic, Asian, Native American, Other, Multiple, or Unknown. White patients served as the reference group in the multivariate analysis. Patients in the Other, Multiple, Unknown, or Native American categories were excluded from this study. Median per-capita income was based on the patient's zip code of residence and extracted from the United States Census database. Patients with zip codes outside

of California or residing in zip codes with no census data were excluded. Finally, data from the county hospital were compared to the private hospitals.

Data were exported to SAS version 9.13 (SAS Institute Inc., Cary, NC) statistical software for subsequent analysis. Statistical significance was determined using Wilcoxon rank-sum test, chi-squared analysis, and multivariable linear and logistic regression. A $P < .05$ was considered statistically significant.

RESULTS

A total of 16,512 patients (county=1,293, private=15,219) were identified for this study. Demographic data and results of the univariate analysis are summarized in **Table 1**. Differences in age and racial/ethnic backgrounds were seen between public and private hospital cohorts. Patients at the county hospital had lower median per-capita incomes (County=\$13,412 vs. Private=\$17,584, $P < .0001$), similar AP rates at presentation (County=26.2% vs. Private=24.4%, $P = .1$), lower abscess drainage rates (County=0.2% vs. Private=2.1%, $P < .0001$), and higher LA rates (County=73.8% vs. Private=59.9%, $P < .0001$). Multivariable analysis demonstrated a higher AP rate (OR 1.4, CI 1.2–1.6), higher LA rate (OR 1.9, CI 1.7–2.2), lower abscess drainage rate (0.07, 95%CI 0.02–0.27), and longer LOH (parameter estimate=0.4, $P < .0001$) at the county hospital. Once within the county hospital, AP rate and LOH were similar across all races/ethnicities and income levels.

Table 1.
Demographic Data and Results of Univariate Analysis

	County (n=1,293)	Private (n=15,219)	P
Age (IQR)	32 (24–42)	38 (28–51)	<.0001
Male Sex	711 (55.0%)	8309 (54.6%)	.8
White	532 (41.1%)	6061 (39.8%)	<.0001
African American	109 (8.4%)	1000 (6.6%)	
Asian	87 (6.7%)	1186 (7.8%)	
Hispanic	555 (42.9%)	6972 (45.8%)	
Mean Per-Capita Income (IQR)	\$13,412 (9,916–17,251)	\$17,584 (13,739–24,251)	<.0001
Appendiceal Perforation	339 (26.2%)	3714 (24.4%)	.1
Laparoscopic Appendectomy	954 (73.8%)	9121 (59.9%)	<.0001
Abscess Drainage	2 (0.2%)	319 (2.1%)	<.0001
Length of Hospitalization (IQR)	2 (1–3)	2 (1–3)	.0001

DISCUSSION

Previous studies have shown that when compared to Caucasians and patients with private insurance, minorities and patients with public insurance have higher appendiceal perforation rates, reflecting decreased access to care.¹⁻⁷ Furthermore, there appears to be racial/ethnic and socioeconomic disparities with respect to the management of appendicitis. Fewer minorities and patients with public insurance undergo operations requiring advanced technology, namely laparoscopy, compared to Caucasians and patients with private insurance.¹⁰⁻¹³ The authors previously demonstrated that disparities in AP rates and LOH were eliminated in a setting of equal health care access.^{8,9} These studies included patients cared for at a single provider system in which all patients had insurance and equal access to clinics, urgent care centers, and emergency rooms. Since all patients had insurance, patients in the lowest socioeconomic level (unemployed, uninsured, or publicly insured patients) were not specifically addressed. Thus, the purpose of the current study was to determine whether patients in the lowest socioeconomic level had differences in access to surgical care, management, and outcomes with respect to the treatment of appendicitis.

To capture patients in the lowest socioeconomic level, patients treated at a safety-net hospital (Harbor-UCLA) were studied. Safety-net hospitals care for the highest percentage of uninsured patients.¹⁴ Based on lower median per-capita incomes, the study confirmed that adult patients treated at a safety-net hospital had a lower socioeconomic status. The existence of safety-net hospitals is vital to the uninsured and unemployed. However, despite treating all comers, access continues to be problematic at safety-net hospitals, as reflected by the higher AP rates compared to that in private hospitals. The financial strain of treating the uninsured and those with advanced disease may lead to differences in management and outcomes at safety-net hospitals. It was found that access to advanced technology was not problematic at the safety-net hospital; however, LA was performed more frequently at the public institution. Factors that may have influenced the LA, rates such as availability of laparoscopic equipment and nursing teams knowledgeable in laparoscopy (especially at night and weekends), were not available for review. Finally, the study could not control for the different surgeons' preference or experience, with respect to operative technique.

An unexpected finding was that LOH was longer at the safety-net hospitals despite the higher use of LA. Previous

studies have suggested that patients treated at safety-net hospitals have worse outcomes.¹⁵ Naturally, increased morbidity will lead to longer LOH. In this study, the only complication reviewed was abscess drainage, which was found to be lower at the safety-net hospital. However, variability exists in the management of postoperative abscess. It may be that more patients at the safety-net hospital were treated with intravenous antibiotics rather than percutaneous drainage due to available resources. Other postoperative complications (such as wound infection) may have contributed to the longer LOH and were not captured in our study. Patients treated at the safety-net hospital may have more associated comorbidities, which would have contributed to a longer LOH and not captured in this study. Finally, the longer LOH may be due to fewer available resources for home care to patients cared for at safety-net hospitals. Thus, discharge from the hospital may be delayed due to lack of transportation, homelessness, or insufficient home care due to lack of available family members. Unfortunately, longer LOH leads to higher medical costs to the hospital and society as a whole.

The study is limited for a number of reasons. The data come from a discharge database, and the ICD-9 coding of each diagnosis and procedure was not independently validated. Thus, negative appendectomy rates cannot be obtained from this database, nor can the duration of symptoms prior to presentation be determined, both of which may have affected the rates of AP and use of LA. Pathologic diagnosis was not able to be determined. Income levels were based on the zip code of residence. Although this is commonly used in healthcare research, there is always a risk of misclassifying patients into incorrect income strata when using aggregate data instead of individual-level measurements. However, previous studies have shown that aggregate statistics from the census block group is a useful proxy for individual-level measures.¹⁶ The racial diversity of our study population may not reflect the population in most other areas of the country, thus the results may not be generalizable. However, the racial demographics seen in this study do closely resemble that of Los Angeles County and California as a whole.¹⁷ The sample sizes were different between the 2 groups, but the sample size difference seen in this study does reflect the ratio of private hospitals to safety-net hospitals in California. To get a large sample size for the safety-net hospital, this study encompassed 10 years worth of data. Having such a long study period may have affected the rates of LA, especially in the early years of this study. Finally, there is heterogeneity in the definition of

intraabdominal abscess. Thus, the authors elected to study postoperative abscess drainage, because it is less likely to be subjected to coding errors. Furthermore, patients requiring abscess drainage reflect a serious postoperative complication requiring additional procedures and resources.

CONCLUSION

In summary, it was found that adult patients with appendicitis treated at a safety-net hospital were of lower socioeconomic background and had higher AP rates and longer LOH, but were more likely to undergo LA and require less abscess drainage. Yet, once within the safety-net hospital cohort, racial and socioeconomic disparities were no longer apparent; thus, these differences between public and private institutions may be due to underlying racial/ethnic and socioeconomic disparities in access to healthcare.

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